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MAGNETIC PROPERTIES OF α-SILICON CARBIDE CRYSTALS

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Silicon carbide is obtained in different polymorphous modifications showing different body colours owing to different impurity contents. Commercial variety of silicon carbide crystals were obtained from Switzerland through the kindness of Prof. G. Busch of E.T.H. Zurich. It has been found that some of the samples are diamagnetic and two varieties are feebly ferromagnetic. For ferromagnetic varieties only magnetic susceptibility of the paramagnetic part has been determined at room temperature. The magnetic susceptibility and anisotropy of all the diamagnetic varieties have been measured at room temperature.

Only two varieties of these have been measured from 90°K to about 1000°K. It has been found that the principle susceptibilities for these two samples increase with temperature whereas the anisotropy remains practically the same. The temperature variation of susceptibility upto a certain temperature has been explained with the relation $\chi = D(kT)^{\alpha}e^{-\frac{\Delta E}{2kT}}$ with $\alpha = -1/4$ The room temperature

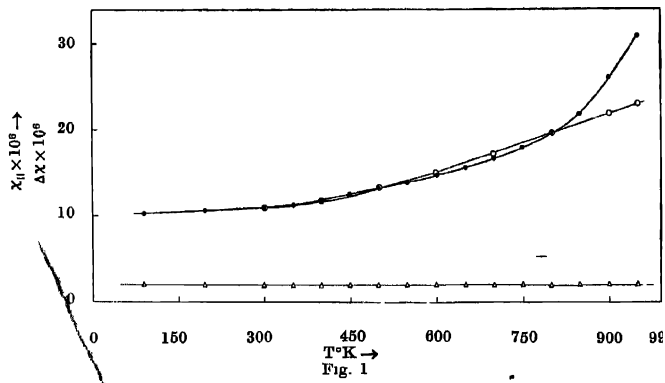

Fig. 1

Temperature variation of susceptibility ($\chi_{\parallel}$) and anisotropy ($\Delta\chi$) of sample —A

● Experimental values of $\chi_{\parallel} \times 10^6$

O Theoretically calculated values of $\chi_{\parallel} \times 10^6$

Δ Anisotropy $(\chi_{\parallel} - \chi_{\perp}) \times 10^6$

TABLE 1

Sample	Colour of the sample	Crystal class of the sample	Orientation of the c-axis w.r. to the field	$\Delta\chi \times 10^6$ per gm.mol.	$\chi_{\parallel} \times 10^6$ per gm.mol	Anisotropy per-cent
A	Pale green transperent	Hexagonal 6H a= 3 073 A° c= 15.08A°	C-axis ‖ to field	0 91621	−10 618	8.1%
F	Light green transperent	Hexagonal 6H a= 3.073 A° c= 15.08 A°	C-axis ‖ to field	0 93111	−12.550	7.6%
I	Deep blue transperent	Hexagonal 6H a= 3 073 A° c= 15 08 A°	C-axis ‖ to field	0 87140	−10 376	7.9%
C	Black opaque	Hexagonal 6H a= 3 073 A° c= 15 08A°	C-axis ‖ to field	0 90312	−7.331	11 3%
H	Deep green transperent	Hexagonal 6H mixed with Rhombo-hedral 15R	C-axis ‖ to field	0 7780	−7 321	9.9%
E	Light green transperent	Rhombohedral 21R a= 3 073A° c= 52.78 A°	C-axis ‖ to field	0.93031	−5.739	14.6%
B	Black opaque	Rhombohedral mixture of 15R and 21R	C-axis ‖ to field	0.82279	−4.200	17.3%
D	Yellowish green transperent	Rhombohedral 15R a= 3.073 A° c= 37.70 A°	C-axis ⊥r to field	—	$\chi_{\perp}$ — 123 744	—
G	Deep blue transperent	Hexagonal 6H a= 3.073A° c= 15.08 A°	C-axis ⊥r to field		$\chi_{\perp}$ = 20.035	—

Sigomony's green Sample — $\Delta\chi$ per gm mol = 0.82×10^{-6} — $\chi_{\parallel}$ per gm mol = 13.1×10^{-6} — η 40%

values of all the measurements are shown in Table I and temperature variation of two varieties are shown graphically in fig 1 and 2. The values of field independent average susceptibility and anisotropy as found by Sigamony (1944) are also given in Table I.

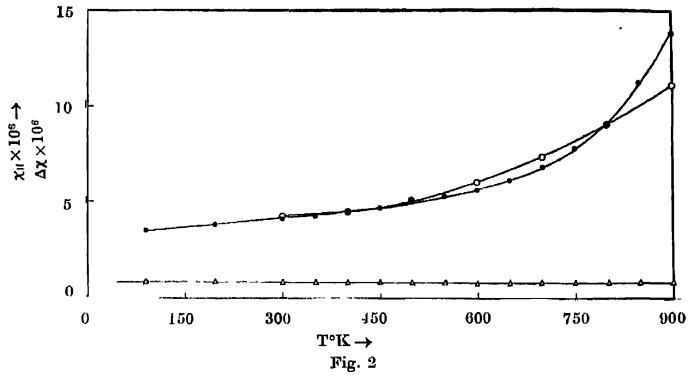

Fig. 2

Temperature variation of susceptibility ($\chi_{\parallel}$) and anisotropy ($\Delta\chi$) of sample —B

● Experimental values of $\chi_{\parallel} \times 10^6$

O Theoretically calculated values of $\chi_{\parallel} \times 10^6$

Δ Anisotropy $(\chi_{\parallel} - \chi_{\perp}) \times 10^6$

The details of these investigations are in course of publication.

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REFERENCE

Sigamony, A., 1944, *Proc. Indian Acad. Science* **19A**, 377-80.